

1. A computer program product for performing computer graphics operations on an image represented by digital data, the product tangibly embodied in a computer-readable medium or propagated signal, the product comprising instructions operable to cause a programmable processor to:

5 receive a representation of a digital image, the image comprising vector objects, each of the objects being specified by control points;

provide an editing brush for interactive editing of the image by a user, the editing brush having a region of influence, the editing brush being operable to apply a displacement function to control points in the region of influence, whereby when the editing brush is applied by the user to the image, a local distortion of the image is generated.

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2. The product of claim 1, further comprising instructions to:

receive a user input specifying a shape for the region of influence.

3. The product of claim 1, further comprising instructions to:

receive a user input specifying a size for the region of influence.

15 4. The product of claim 1, further comprising instructions to:

add control point triplets to curves within the region of influence to refine the complexity of the image preparatory to application of the editing brush.

5. The product of claim 4, further comprising instructions to:

determine at each application of the editing brush whether to add control point triplets according to a user-specified value of a detail parameter.

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6. The product of claim 4 or 5, further comprising instructions to:

remove from the image those control point triplets added to refine the complexity of the image that were not displaced by application of the editing brush.

7. The product of claim 4, further comprising instructions to:

25 save curve segment data of the image before application of the editing brush and replace segments of image curves that have not been distorted by the editing brush are replaced with their previously saved copies.

8. The product of claim 4, further comprising instructions to:  
apply a path simplification process in a piece-wise fashion to areas of curves that have been distorted.
9. The product of claim 1, wherein the displacement function provides a smooth falloff to zero influence at the limit of the region of influence.  
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10. The product of claim 1 or 2, further comprising instructions to:  
determine a continuity constraint for each anchor point in the region of influence before the displacement function is applied; and  
ensure that each anchor point in the region of influence satisfies the continuity constraint  
10 after the editing brush is applied.
11. The product of claim 1 or 2, wherein each control point is either an anchor point or a tangent handle, the product further comprising instructions to:  
determine a continuity constraint in the region of influence for each anchor point that has at least one adjacent tangent handle also in the region of influence, the continuity constraint being determined before the displacement function is applied; and  
15 ensure that the continuity constraint for each such anchor point is satisfied after the editing brush is applied.
12. The product of claim 1, wherein a parameter of the displacement function is a trajectory of the editing brush as applied by the user.
- 20 13. The product of claim 1, wherein the displacement function defines a vector field of displacements over the region of influence.
14. The product of claim 13, wherein a trajectory of the editing brush as applied by the user determines a rotational orientation of the vector field around an axis perpendicular to an image plane.

15. The product of claim 1, further comprising instructions to implement a simplify editing brush, comprising instructions to:

smooth details of curves; and  
remove superfluous control points.

5        16. The product of claim 15, wherein the instructions to smooth comprise instructions to:  
move control points of a curve in the region of influence towards the overall sweep of the curve.

17. The product of claim 15, wherein the instructions to remove control points comprise instructions to:

10      remove control points at a rate determined by the user.

18. The product of claim 1, wherein the displacement function defines a swirl effect.

19. The product of claim 1, wherein the displacement function defines a warp effect.

20. The product of claim 1, wherein the displacement function defines an exhale effect.

21. The product of claim 1, wherein the displacement function defines an inhale effect.

15      22. The product of claim 1, wherein the displacement function defines a scallop effect.

23. The product of claim 1, wherein the displacement function defines a crystallize effect.

24. The product of claim 1, wherein the displacement function defines a wrinkle effect.